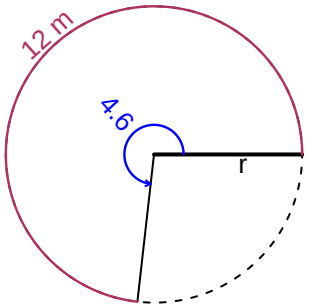
Name: Date:

Trig Final (Solution v12)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.6 radians. The arc length is 12 meters. How long is the radius in meters?

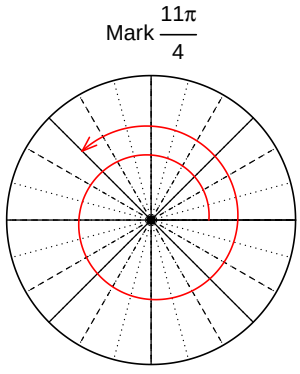


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

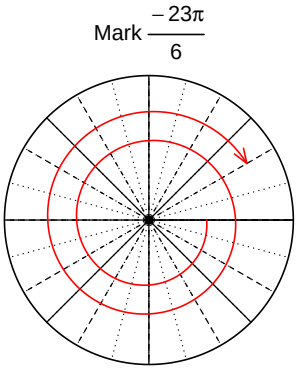
$r = 2.609$ meters.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(11\pi/4)$



Find $\sin(-23\pi/6)$

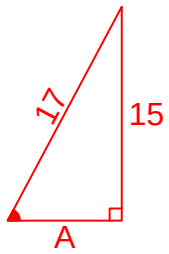
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-23\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{15}{17}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

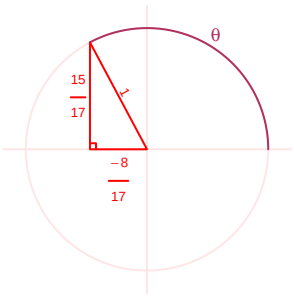
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 15^2 = 17^2$$
$$A = \sqrt{17^2 - 15^2}$$
$$A = 8$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{15}{17}}{\frac{-8}{17}} = \frac{-15}{8}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.08 meters, a midline at $y = 3.69$ meters, and a frequency of 6.69 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.08\sin(2\pi 6.69t) + 3.69$$

or

$$y = 5.08\sin(13.38\pi t) + 3.69$$

or

$$y = 5.08\sin(42.03t) + 3.69$$